On the anomalous Magnetic Action of Hot Iron between the White and Blood-red Heat. By Peter Barlow, *Esq. of the Royal Military Academy. Communicated by Major* Thomas Colby, *of the Royal Engineers, F.R.S.* Read January 24, 1822. [*Phil. Trans.* 1822, *p.* 117.]

Finding the attractive power of soft malleable iron and steel for a magnet greater than that of cast-iron and hard steel, the author was desirous of ascertaining the effect of heating these bodies in a furnace, so as to render them perfectly soft, upon their magnetic power. With this view the bars were rendered white-hot, and being placed in the direction of the dip, their powers were found nearly equal. It was however found that there was a point between the white heat, at which all magnetic action was lost, and the blood-red heat, at which it was strongest, at which the iron attracted the needle the contrary way to which it did when cold; viz. if the bar and compass were so placed that the north end of the needle was drawn to it when cold, the south end was attracted during the interval above-mentioned.

The author then proceeds to detail some further experiments in illustration of this anomalous magnetic action, from which it appears that the quantity of magnetic attraction at a red heat is influenced by the height or depth of the centre of the bar from the compass; and as the natural effect of the cold iron was changed by placing the compass below the centre of the bar, it became a question how far the negative attraction was also changed. To decide, the compass was lowered to within six inches of the bottom of the bar, when the cold iron produced a deviation of 21°, by attracting the south end of the needle. At a white heat its power ceased; but as this subsided to bright red the negative attraction amounted to $10\frac{1}{2}°$, the north end of the needle being attracted to the iron; it then gradually returned to due north, and ultimately to 70° 30′ on the opposite side.

Mr. Barlow then gives the results of another series of experiments made with the bars inclined in the direction of the dipping-needle, showing that where the negative attraction was greatest the natural attraction was least, that is, opposite the middle of the bar, or in the place of no attraction.

Being doubtful how far the heat itself, independent of the iron, might be the cause of the anomalous action above described, the author substituted a heated copper bar for that of iron, but it produced no motion in the needle. He thinks it probable that the anomalies may depend upon the iron cooling faster towards its extremities than towards its centre, one part of the bar thus becoming magnetic before the other, and choosing a different species of attraction.